FEDOR SHMAROV

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PERSONAL PROFILE

I am an enthusiastic and motivated researcher with a strong background in formal reasoning and model checking. Currently I am working on a project sponsored by the Rosetrees Trust where I perform mathematical modelling of ultraviolet phototherapy for treating psoriasis and apply machine learning techniques to clinical data for designing personalised treatments.

WORK EXPERIENCE

Newcastle University, UK *2017 - present*
Research Associate in the School of Computing

Projects:
Project Title: Personalised ultraviolet B (UVB) treatment of psoriasis through biomarker integration with computational modelling of psoriatic plaque resolution
Principal Investigators: Dr Paolo Zuliani and Prof Nick Reynolds
Sponsors: Rosetrees Trust

EDUCATION

Newcastle University, UK *2013 - 2018*
Ph.D. in Computing Science
Thesis Title: Probabilistic Bounded Reachability for Stochastic Hybrid Systems
Supervisor: Dr Paolo Zuliani
Summary: I developed novel methods combining formal verification techniques and statistical model checking for probabilistic reachability analysis and parameter set synthesis in stochastic parametric hybrid systems. I implemented these methods in the tool called ProbReach (available at `https://github.com/dreal/probreach`).

Newcastle University, UK *2012 - 2013*
M.Sc. (with Distinction) in Advanced Computer Science

Tambov State Technical University, Russia *2007 - 2011*
B.Sc. (with Honours) in Information Science and Computer Technology

PUBLICATIONS

- N. Watson, N. Wilson, **F. Shmarov**, P. Zuliani, G. Smith, N.J. Reynolds, and S.C. Weatherhead. "Towards predicting response to phototherapy in psoriasis using clinical and serum biomarkers with machine learning techniques". *J Invest Dermatol. Under review.*
- **F. Shmarov**, S. Soudjani, N. Paoletti, E. Bartocci, S. Lin, S.A. Smolka, and P. Zuliani. "Automated Synthesis of Safe Digital Controllersfor Sampled-Data Stochastic Nonlinear Systems". *IEEE Transactions on Automatic Control. Under review.*
- **F. Shmarov**, N. Paoletti, E. Bartocci, S. Lin, S. Smolka, and P. Zuliani. "SMT-based Synthesis of Safe and Robust PID Controllers for Stochastic Hybrid Systems". *Proceedings of the 13th International Haifa Verification Conference (HVC 2017)*, pp. 131-146.

- **F. Shmarov**, and P. Zuliani. "Probabilistic Hybrid Systems Verification via SMT and Monte Carlo Techniques" in *HVC*. LNCS, vol. 10028, 2016, pp. 152–168.
- **F. Shmarov**, and P. Zuliani. "SMT-based Reasoning for Uncertain Hybrid Domains," in *AAAI-16 Workhop on Planning for Hybrid Systems, 30th AAAI Conference on Artificial Intelligence*, 2016, pp. 624–630.
- C. Madsen, **F. Shmarov**, and P. Zuliani. "BioPSy: an SMT-based Tool for Guaranteed Parameter Set Synthesis of Biological Models," in *CMSB*, ser. LNCS, vol. 9308, 2015, pp. 182–194.
- **F. Shmarov**, and P. Zuliani. "ProbReach: a Tool for Guaranteed Reachability Analysis of stochastic parametric hybrid systems," in *Symbolic and Numerical Methods for Reachability Analysis, 1st International Workshop, SNR 2015*, ser. EPiC Series in Computing, S. Bogomolov and A. Tiwari, Eds., vol. 37, 2015, pp. 40–48.
- **F. Shmarov**, and P. Zuliani. "ProbReach: Verified Probabilistic Delta-Reachability for stochastic parametric hybrid systems," in *HSCC*. ACM, 2015, pp. 134–139.

WORKSHOP PRESENTATIONS

- **F. Shmarov**, P. Zuliani, G. Smith, N. Reynolds. "A Mechanistic Model of Psoriatic Epidermis and Psoriasis Therapies". *Poster session at PSORT consortium showcase, 2019.*
- **F. Shmarov**. "Probabilistic Bounded Reachability for Stochastic Hybrid Systems". *Third Workshop on Design and Analysis of Robust Systems (DARS), 2018.*
- **F. Shmarov** and P. Zuliani. "ProbReach: Probabilistic Bounded Reachability for Uncertain Hybrid Systems". *International Workshop on Formal Methods for Rigorous Systems Engineering of Cyber-Physical Systems (RiSE4CPS), 2017.*
- **F. Shmarov**. "Stochastic Hybrid Systems: Modelling Cancer and Psoriasis". *International Workshop on Automated Reasoning for Systems Biology and Medicine (ARSBM), 2016.*

TECHNICAL SKILLS

- Programming Languages: C/C++, Java, Python, MATLAB, R, SQL
- Operating Systems: Linux, Windows, OS X

PERSONAL SKILLS

- Experienced public speaker and presenter
- Languages: English (fluent), Russian (native)

TEACHING EXPERIENCE

- As Research Associate I have co-supervised final projects for several undergraduate and master students.
- As PhD student I worked as a demonstrator for several school modules for undergraduate and master students.

AWARDS

- In 2013 I received the Philip Merlin prize from the School of Computing Science for the Best MSc Dissertation.